GC400 Series – GC401-GC404 User Manual

User Manual for GC401-GC404 with firmware Ver. 0.41 and above, HW revision 03

For modules with serial numbers from 0011009

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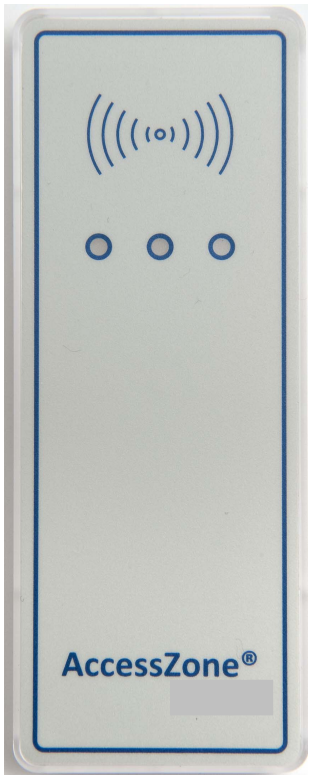
AccessZone® System - *A Key to a Safer Future*

Congratulations on choosing an AccessZone® GC400 Bluetooth Reader. It is a flexible and easy to use system for controlling access to doors and gates to private homes, shops and small and middle size companies. It enables quick configuration with a few simple commands entered on a standard mobile phone with Bluetooth without installing any software. No license or subscription is required. The Bluetooth ID is send on the Wiegand bus to an external controller.

This manual covers the easy configuration and use of the AccessZone® GC400 series of Wiegand Bluetooth Readers:

- GC401 – 2 admin. and 5 users
- GC402 – 2 admin. and 10 users
- GC403 – 2 admin. and 20 users
- GC404 – 2 admin. and 50 users

Please see the GC400 series Installation Manual for instructions on how to install the system.



AccessZone® GC400 with
3 inputs/2 outputs
Form factor 127 x 47 x 8 mm

Get easy and seamless accesses to the secured areas with your mobile phone working as a secure access key from a distance of 0.1 up to 10 meters.

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1 Disclaimer

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The displayed screens may differ and depends on the mobile phone used for configuration.

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2 Introduction

The AccessZone GC400 series GC401-GC404 are Wiegand Bluetooth ID Readers. They are well suited for use in private homes, shops and companies. Since they have Wiegand output they can be used with all systems with Wiegand input.

They are unique wireless Bluetooth Readers with the latest Bluetooth technology – a wireless technology that operates in the license free ISM band at 2.4 GHz.

The reader sends the Bluetooth ID on the Wiegand bus for verification in a central access control system. No validation is done in the system. However, it is possible to add some unique Bluetooth IDs with an optional 4 digit PIN code for increased security. I.e. the Bluetooth ID will first be sent to the central access controller for final access verification after the unique PIN code has been entered by the user.

The used mobile phones or other Bluetooth devices must be set to “visible” to allow them to be discovered by the system.

The GC400 series eliminates the need for mechanical readers and keyboards outside the secured area. This removes the risk for property damage and breakdown due to harsh environmental conditions and heavy use.

Please refer to the GC400 Firmware Release Note for the latest changes.

3 Security Precautions

Several security precautions have been implemented in the system to make it safe to use.

The system will only accept system configuration commands in a special configuration mode (refer to section 7.2 How to enter Configuration Mode).

All system configuration commands are entered by temporarily changing the mobile phones friendly name[1)] and must be followed by a unique 8 digit master PIN code. The master PIN code should only be known to a limited number of people (system administrators).

The 8 digit master PIN code should be changed and is unique for each GC401-GC404 system. It can be entered from any Bluetooth enabled mobile phone. Please change the master PIN code before continuing.

Two privileged users (administrators) can add and delete users at any time. Refer to section 7.4 How to Add or Delete Users – Normal Operation.

[1)]***Caution!***
The Bluetooth friendly name feature is used for commands and can be read from another Bluetooth device from the distance (typically up to 10 meters).

Therefore it is highly recommended to immediately change the Bluetooth friendly name again or make the mobile phone invisibly to avoid that unauthorized people read the commands containing vital user information.

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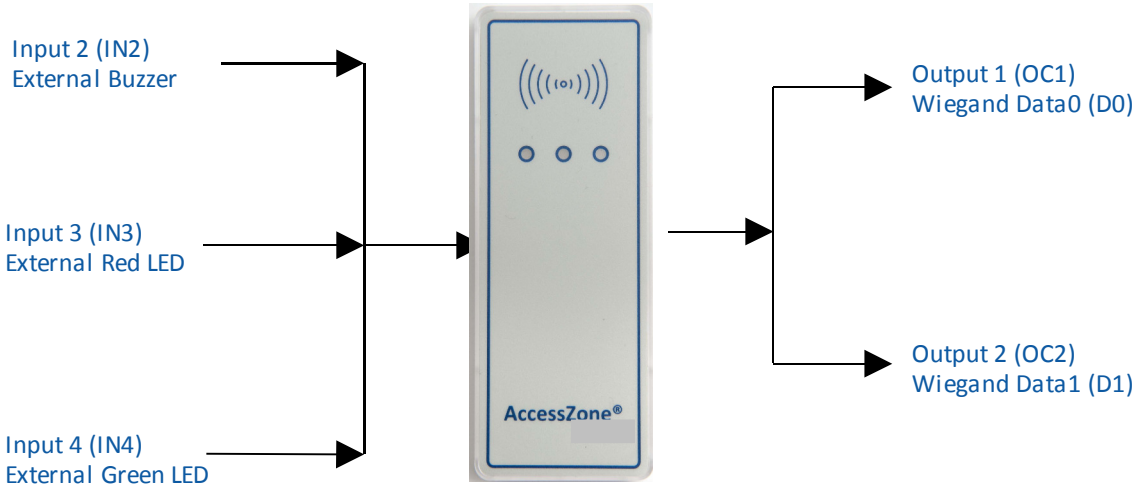
4 System Overview

This section presents a system overview with an I/O description:



5 I/O Description

GC400 series have 3 inputs and 2 outputs.

The active levels (high '1'/low '0'), when an action is performed, can be configured (inverted) for some inputs/outputs. Please refer to section 8.5 Change System Configuration Command 2 – Advanced settings for more details.

5.1 Inputs

- Input 1 (IN1) - Not used
- Input 2 (IN2) - External control of buzzer / entering configuration mode during power up
- Input 3 (IN3) - External control of Red (dual) LED
- Input 4 (IN4) - External control of Green (dual) LED

5.2 Outputs

Open collector type (500mA):

- Output 1 (OC1) - Wiegand Data0 (D0) output for external access controller
- Output 2 (OC2) – Wiegand Data1 (D1) output for external access controller

Please see the GC400 series Installation Manual for instructions on how to install the system.

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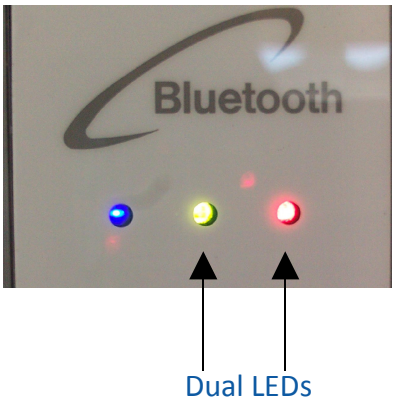
6 LED Status



The GC400 series have 3 internally controlled LEDs (Blue, Green and Red) and two externally controlled LEDs (Red and Green) for system indications.

- The Green LED (mid) is a dual LED with an additional Red LED. It is controlled though input 3 (Orange core)
- The Red LED (right) is a dual LED with an additional Green LED. It is controlled though input 4 (Blue core)

6.1 Power Up

The Blue LED and Red LED will light for 2 seconds from power up. This is the bootloader waiting for new firmware.

6.2 Blue LED

Normal Mode - the Blue LED is solid on. It flashes shortly when any Bluetooth device ID is read.

Configuration Mode - the Blue LED blinks 1 time/sec. The device can accept commands

6.3 Green LED / Ext. Red LED

The Green LED flashes shortly when an Bluetooth ID has been read and is send on the Wiegand bus.

The external Red LED is by default OFF (leave not connected). It can be controlled from an external controller through input 3 (Orange Core). The LED is set ON by pulling input 3 down to GND.

6.4 Red LED / Ext. Green LED

The Red LED flashes shortly when an Bluetooth ID has been read but it could not be send on the Wiegand bus because it was busy (to avoid collisions).

The external Green LED is by default OFF (leave not connected). It can be controlled from an external controller through input 4 (Blue Core). The LED can be set ON by pulling input 4 down to GND.

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7 How to Configure the System

This section describes how to enter system commands and how to enable the system for configuration. Section 8 System Commands describes the different commands in details.

7.1 Commands via Mobile

System configuration (adding/deleting users and changing system settings) can be done from any Bluetooth enabled mobile phone.

Note!
It is not necessary to install any software on the mobile phone or use any PC tool.

The mobile phone used must support at least 20 characters as “Friendly Name” (also called "Phone Name”). This is the name revealed for other Bluetooth devices.

A system command (e.g. "01,0022b4b62918,1234") is entered by temporarily changing the mobiles Bluetooth “Friendly Name”. Refer to section 8 System Commands.

Please refer to the User Manual for a specific mobile phone type for how to change the Bluetooth friendly name.

Caution!
The Bluetooth specification states a maximum length of 248 characters as Friendly Name. However, most mobile phones have limited the space allowed for Friendly Name. A minimum of 20 characters must be supported by the used mobile phone.

All commands must be followed by an 8 digit master PIN code for safe use. The system gives 3 short beeps to indicate that a valid command has been found and the master PIN code is required. The user will automatically be prompted when to enter the master PIN code.

Note!
This is not the normal 4 digit user access PIN code.

Please note when entering the commands:

- **All command parameters (enclosed by <>) must be separated by a comma ','**
- **No spaces between values are allowed**
- **Have the exact length as specified. I.e. no additional characters in the end**
- **A ‘-‘ indicates an integer range 1,2,3…**

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7.2 How to enter Configuration Mode

The system must be set into configuration mode before it will accept the system commands. However, it is possible for two privileged users (administrators) to use the Add new User and Delete User commands in normal mode (Refer to section 7.4 How to Add or Delete Users – Normal Operation).

Follow these steps to enter configuration mode:

Steps:

1) Power off the module
2) Pull down the buzzer input (IN2) to GND
3) Power on the module again
4) The buzzer input can be released again after the short beep

The system is now in configuration mode for 10 minutes and will flash with the Blue LED. Refer to section 7.3 How to enter System Commands – Configuration Mode for how to enter system commands.

The system coverage range will be limited to approximately 20 cm in the configuration period to prevent that unauthorized people can tamper with the system.

The configuration period is restarted every time a valid command has been executed.

Configuration mode is automatically terminated after 10 minutes without any valid commands by sending 2 short beeps or by power cycling the device to startup in normal operation (Buzzer input (IN2) is not pulled down to GND).

Note!

The system will not scan for (detect) users in configuration mode. I.e. no Bluetooth IDs are send on the Wiegand bus

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7.3 How to enter System Commands – Configuration Mode

The system commands (adding/deleting users and changing system settings) can be executed from any Bluetooth enabled mobile phone by temporarily changing the mobile phones friendly name.

After entering a command and the master PIN code the system gives a short beep to indicate that the command has been accepted and executed and restarts the 10 minute configuration period. The next command can be entered, or wait for the termination of the configuration period or power cycle the device to startup in normal operation.

Note!
3 short beeps indicate when to use the master PIN code instead of normal access PIN code.

Follow these steps to execute commands:

Steps:

1) Set system into configuration mode. Refer to section 7.2 How to enter Configuration Mode
2) Enable Bluetooth on mobile phone and set it to hidden
3) Enter the required system command on the mobile phone and click save. Refer to section8 System Commands for available commands
4) Set the mobile phone to visible
5) Place mobile phone within the detection range of the system
6) Wait for 3 short beeps
7) Enter Master PIN code (e.g. 12345678) when prompt
8) Wait for beep for successful execution of the command
9) Set the mobile phone to invisible/hidden
10) Erase command from mobile phone

If more commands must be executed repeat step 2) – 9)

7.3.1 If the system doesn't respond to a command:

- System is not in configuration mode any more (10 minutes time out)
  - Check Blue LED - flashing? Else re-enter configuration mode. Refer to section 7.2 How to enter Configuration Mode
- The administrator is outside the allowed configuration range
  - Administrator must get closer to the system
- The command has already been executed
  - Try change one of the parameters or try another command
- The command is not valid
  - Wrong number of parameters, wrong parameter values and/or wrong command length (e.g. spaces at the end)
- The system times out waiting to read the command or connection to mobile failed
  - Wait for next detection

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7.4 How to Add or Delete Users – Normal Operation

Privileged users (administrators) are stored on storage position 01 or 02. These two privileged users (administrators) are allowed to add and delete users from normal operation mode. I.e. it is not necessary to enter configuration mode first.

The user (administrator) must first enter the normal access 4 digit PIN code as normal and if a valid and new Add new User or Delete User command is found the 8 digit master PIN code.

A short beep indicates that the command has been successfully executed as in normal configuration mode.

TIP!
Make sure that the mobile phone used is stored on position 01 or 02 and with an access PIN code before continuing. It will not accept commands in this mode if PIN code is not used.

Follow these steps to add or delete a user:
Steps:

1) Enter the required Add new User or Delete User command on the mobile phone and click save (refer to section 8.2 Add new User Command and 8.3 Delete User Command)
2) Set the mobile phone to visible
3) Place mobile phone within the detection range of the system
4) Enter normal access PIN (e.g. 1234) when prompt – ID is sent on Wiegand bus if correct
5) Wait for 3 short beeps
6) Enter Master PIN code (e.g. 12345678) when prompt
7) Wait for beep for successful execution of the Add new User or Delete User command
8) Set the mobile phone to invisible/hidden
9) Erase command from mobile phone

If more users must be added/deleted repeat step 1) – 8)

7.4.1 If the system doesn't respond to a command:

- The administrator is outside the normal access range
  - Administrator must get closer to the system
- The command has already been executed
  - Try change one of the parameters or try another command
- The command is not valid
  - Wrong number of parameters, wrong parameter values and/or wrong command length (e.g. spaces at the end)
- The system times out waiting to read the command or connection to mobile failed
  - Wait for next detection

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8 System Commands

This section describes the simple and easy to use mobile configuration command set for GC401 - GC404- the Wiegand series.

8.1 Change 8 digit Master PIN Code Command

This command changes the master PIN code which is used to validate all system commands. The system will automatically prompt the user for the Master PIN code.

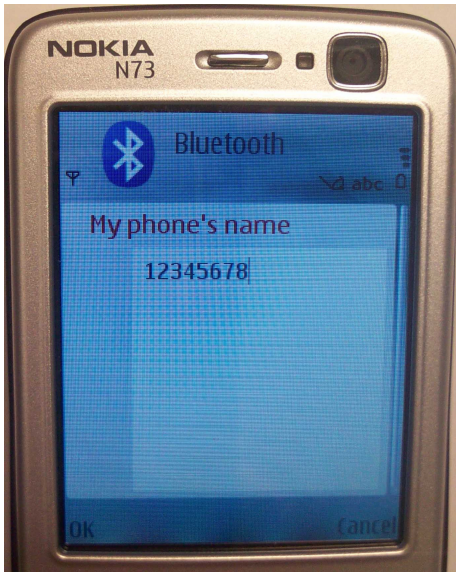
The Master PIN code is a system code for authenticating the user/system administrator.

Caution!
The default master PIN code should be changed before use of the system. The Master PIN code should only be known by a system administrator or a limited number of people to avoid unauthorized use.

Parameters	Values	Description
<New Master PIN code for the system>	8 digits	The Master PIN code for adding/removing users and change system settings Default: “12345678”

Total length = 8 digits

Ex: To change Master PIN to 12345678 enter: "**12345678**"



Note!
The present (old) Master PIN code must be entered on the mobile to enable the new Master PIN code.

The Master PIN code can be reset to factory value. Please see section 13 Default Factory System Settings

System administrator should store the new master PIN code in a system log. Please see 15 Appendix B – System Master PIN Code

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8.2 Add new User Command

This command adds a new user to the system. This is also used for editing an exiting user. Make sure to store the user on the same storage position.

This command can also be execute in normal mode by the privileged users (administrators) on storage position 01 and 02.

Parameters	Values	Description
<Add storage position>,	2 digits 01-02 03-07 03-12 03-22 03-52	Position in system database to store the user Privileged users (administrators): “01”-“02” [1)] Normal users GC401: “03”-“07” Normal users GC402: “03”-“12” Normal users GC403: “03”-“22” Normal users GC404: “03”-“52” E.g. position 1 is written as “01”
<BD address of new device>,	12 digits	The unique Bluetooth address of device Valid values ‘0’-‘9’ and ‘A’-‘F’ or ‘a’-‘f’ E.g. “001256ABCDEF”, “00BB592F030B”
<PIN code for user>	4 digits	User access PIN code E.g. “1234” Use “0000” to disables use of access PIN code for that particular user
<power class> (optional – not required)	1 digit 1-3	Device power class [2)] '1' = strong device '2' = standard device '3' = weak device. Default: ‘2’

[1)]The privileged users (administrators) must be added with a PIN code to be able to add other users. This is a security requirement.

[2)] Can be used to compensate (normalize), in some degree, for power differences and antenna location between the used Bluetooth keys (mobile phones):

- If a device must be closer to the reader than most others before the Bluetooth ID is send - set parameter = '3' (weak device)
- If the Bluetooth ID is send further away from the reader than most others - set parameter = '1' (strong device)

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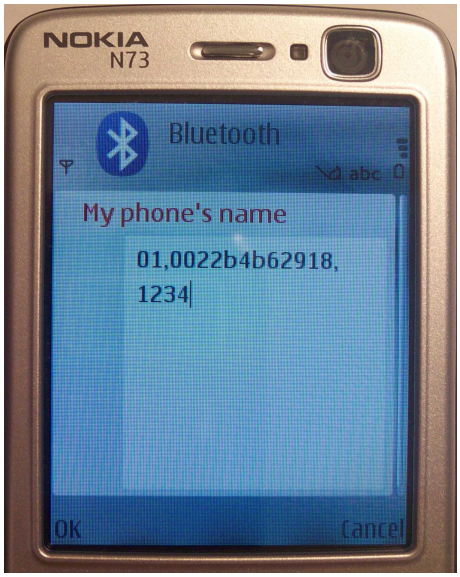
Total length = 20 digits or optional 22 digits



Examples:
Add unique user 0022b4b62918 with PIN code 1234 enter: "**01,0022b4b62918,1234**"

Add unique user 0022b4b62918 without PIN code enter: "**01,0022b4b62918,0000**"

Add unique user 0022b4b62918 without PIN code and strong enter: "**01,0022b4b62918,0000,1**"

Add unique user 0022b4b62918 without PIN code and weak enter: "**01,0022b4b62918,0000,3**"

Note!
Any exiting user on the storage position selected will be erased. I.e. it is not necessary to erase an existing user first.

System administrator should maintain a system log of users and storage positions used. Please see 14 Appendix A – User Log Template

Caution!
A virtual "any" user is by default (factory) added at storage position 01 (a privileged user) to allow an easy – first time - configuration of users without going through the normal system configuration mode. PIN code 1234 is used (Command:."01,FFFFFFFFFFF,1234")

Bluetooth ID reader with unique users with PIN code:
It is highly recommended to overwrite this with a specific user with a unique PIN code and move the "any" default user to the last location used. In example, move "any" user to the last storage position 7 (GC401):
Execute command:."07,FFFFFFFFFFF,0000"

The privileged users (devices) added on position 01 or 02 can be used to add other users and the "any" user on position 07 will allow the system to send all other Bluetooth IDs on the Wiegand bus.

Simple Bluetooth ID reader:
Add the "any" user without PIN code on storage position 01 if PIN code and no privileged users (01 and 02) are not required. The Bluetooth reader will now send all the detected Bluetooth IDs on the Wiegand bus:
Execute command:."01,FFFFFFFFFFF,0000"

Refer to section 10 Virtual Keypad for more details

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8.3 Delete User Command

This command deletes a user from the system.

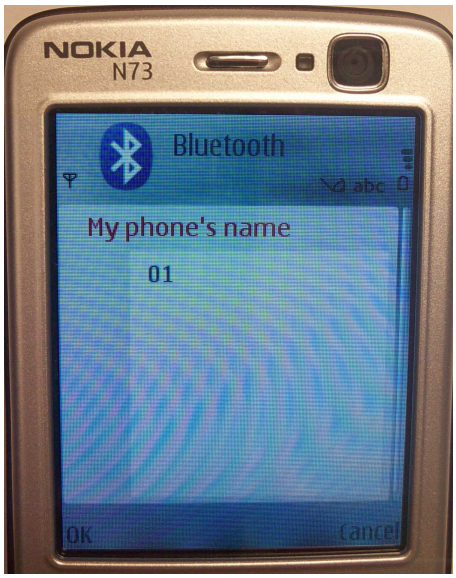
This command can also be execute in normal mode by the privileged users (administrators) on storage position 01 and 02.

Parameters	Values	Description
<Delete storage position>	2 digits 01-02 03-07 03-12 03-22 03-52	User position to delete from system database Privileged users (administrators): “01”-“02” Normal users GC401: “03”-“07” Normal users GC402: “03”-“12” Normal users GC403: “03”-“22” Normal users GC404: “03”-“52” Ex. position 1 = “01”, 8 = “08” and 10=”10”

Total length = 2 digits

Ex: Delete user stored on position 1 enter: "**01**"

Note!
An exiting user can also be deleted by adding a new user on the same storage position. I.e. it is not necessary to use the delete command first.



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8.4 Change System Configuration Command 1

This command can change the system configuration setting and thereby be customized to your needs.

Parameters	Values	Description
<Wiegand facility code>,	2 digits 0x00-0xFF	The facility code is a number used to uniquely identify the reader on the Wiegand bus. The number should be uniquely selected to avoid duplicates in a system. **The number is entered as a hexadecimal number.** E.g. 0x20 is written as “20” 0x00 = “00” (0) and 0xFF=”FF” (255) Default: “20” (32)
<Wiegand type>,	2 digits 1-10	The number selects the Wiegand frame format to used: “01” = Wiegand 26 – de facto “02” = double Wiegand 26 frame “03” = triple Wiegand 26 frame “04” = Wiegand 34 “05” = Wiegand 42 “06” = Wiegand 50 “07” = Wiegand 58 “08” = Wiegand 40 with XOR checksum “09” = Wiegand 56 with XOR checksum “10” = Wiegand 64 with XOR checksum E.g. 01 is written as “01” Default: “01” = Wiegand 26

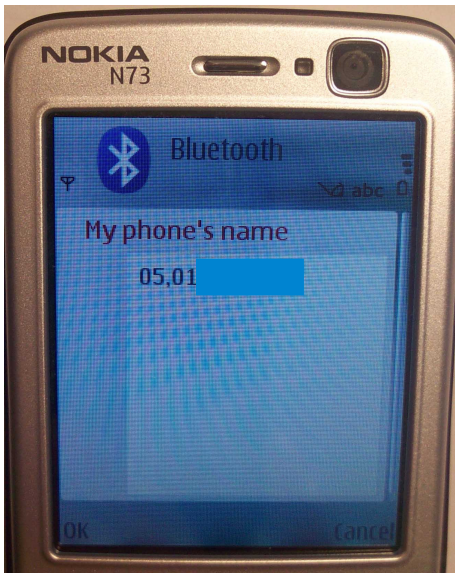
Total length = 5 digits

Ex: to select facility code 5 and standard Wiegand 26 enter: "**05,01**"

Refer to section 9 Wiegand Types

The system settings can be reset to factory value. Please see section 13 Default Factory System Settings

System administrator should maintain a system log with changed System Settings for Normal Operation Mode. Please see 16 Appendix C – System Configuration Log Template



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8.5 Change System Configuration Command 2 – Advanced settings

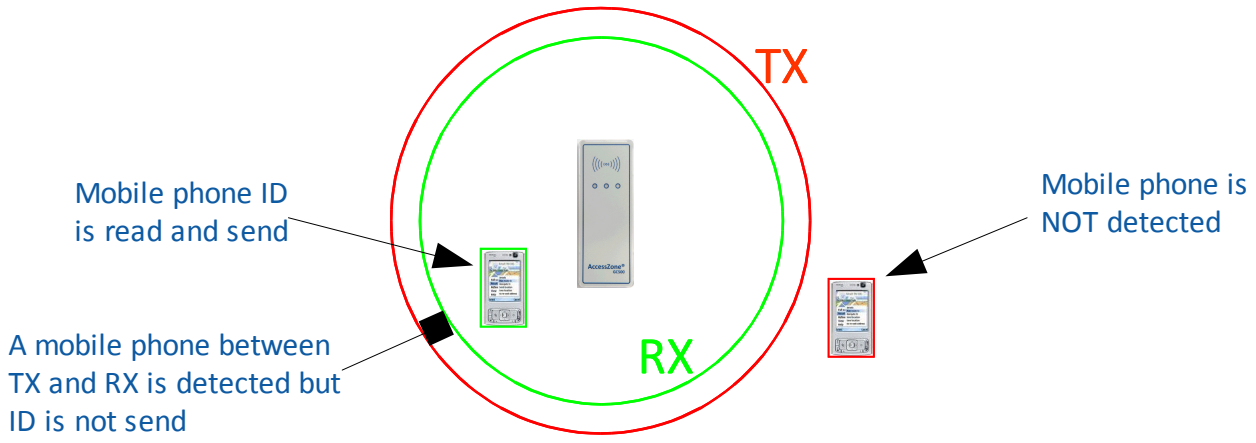
This command can change the additional system configuration settings and thereby be customized to your needs.

Caution!
Caution must be taken when changing these system configuration parameters. Please refer to section 12.1 Detection Range Command Examples.

Parameters	Values	Description
<power range>,	1 digit 1-3	Maximum transmit power range (TX) [1)] '1' ≈ 0,1 m - 2 m '2' ≈ 0,5 m - 10 m '3' ≈ 5 m - 100 m Default: '1'
<TX power level>,	1 digit 1-8	System transmit power (TX) level [1)] 1≈0,1 m - 8≈ 10 m Default: '3'
<Detection range>,	2 digits 00-99	Device detection range (RX) [1)] "00"=shortest distance, "99" longest distance Default: "40"
<Input1 active level >,	1 digit 0 or 1	'0'=low active (GND), '1'=high active (open) Default: '0' - **NOT USED**
<Input2 active level >,	1 digit 0 or 1	'0'=low active (GND), '1'=high active (open) Default: '0'
<Output1 active level >,	1 digit 0 or 1	'0'=low active (GND), '1'=high active (12V DC) (Open collector output for alarm/light) Default: '1' - **NOT USED**
<Output2 active level >	1 digit 0 or 1	'0'=low active (GND), '1'=high active (12V DC) (Open collector output for gate/door) Default: '1' - **NOT USED**

Note!
Input 3 and input 4 are by default low active '0' (GND) and cannot be changed.

[1)] The figure show the relation between TX and RX. A mobile phone must be within the RX (green) zone and TX should ideally be on RX or a little longer



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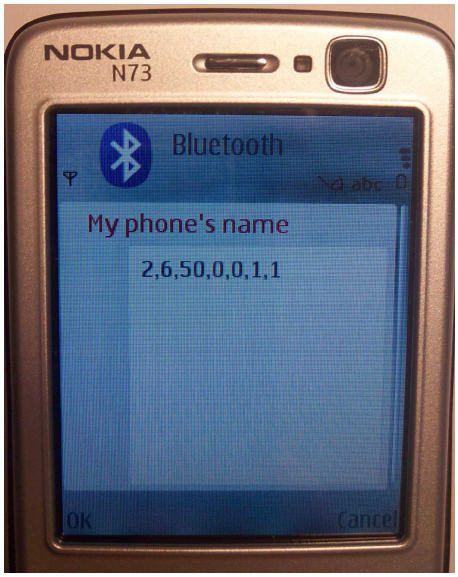
Total length = 14 digits



Ex: To select power range 2 (<10 m), and approximately 0,5 m with input 1 and 2 active at low level (GND) and output 1 and 2 with high level enter: "**2,6,50,0,0,1,1**"

There is a close relation between parameters <power range>, <TX power level> and <Detection range>. The system detection range depends on selected <power range>, <TX power level>.

Shortest detection range is with <power range>=1, <TX power level>=1 and <Detection range>0

Longest detection range is with <power range>=3<TX power level>=8 and <Detection range>99.

System must be power cycled for changes to take effect.

The System settings can be reset to factory value. Please see section 13 Default Factory System Settings

Please see section 12 Access Detection Range for some typical values for <power range>, <TX power level> and <Detection range> and how to adjust detection range.

System administrator should maintain a system log with System Settings 2 for Normal Operation Mode. Please see 16 Appendix C – System Configuration Log Template

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9 Wiegand Types

The GC400 series supports 10 different Wiegand frame formats. The Wiegand access controller must support at least one of the supported Wiegand formats.

GC400 uses the Wiegand signalling and different frame data formats:
The data is send on the Wiegand bus. I.e. a '0' is send on line Data0 and a '1' is send on line Data1. The signals are held at logical high levels until the data is sent. GC400 places the data as asynchronous low-going pulses on the Data0 or Data1 lines to transmit the data to the access control system.

The Wiegand specification requires a pulse width time between 20 µs and 100 µs and a pulse interval time between 200 µs and 20ms. GC400 uses a pulse width of 50 µs and a pulse interval time of 2 ms.

A 8 bit facility code and Bluetooth ID lengths between 16-48 bit are used depending on the selected Wiegand type.

Frame format:

1 bit MSB even parity	8 bit Facility code	16-48 bit of Bluetooth ID	1 bit LSB odd parity

Caution!
Mathematically it only gives a total of 256 different (0 to 255) facility codes. The shortest Wiegand format (Wiegand 26) only uses the lowest 16 bit of the Bluetooth ID number which gives a total of 65.536 (0 to 65.536) individual ID's. Due to the mathematical limitations of the Wiegand 26 format duplicates may occur. However, if Wiegand 58 is used instead all 48 bit of the unique Bluetooth ID number is send

For a general introduction to Wiegand refer to http://en.wikipedia.org/wiki/Wiegand_protocol

9.1 Wiegand 26

"01" = Wiegand 26 frame

This is the classic (de facto) Wiegand 26 frame format.

Frame: The last 2 bytes (LSB) of the 6 byte Bluetooth ID is sent together with the facility code. A even MSB parity bit and a odd LSB parity makes a total of 26 bits (1+8+16+1)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "2508" is send

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9.2 Double Wiegand 26

“02” = double Wiegand 26 frame

Same as Wiegand 26 but the Bluetooth ID is sent in 2 Wiegand 26 frame with 25 ms delay between:

Frame 1: The facility code and the last 2 bytes (LSB) of the 6 byte Bluetooth ID is sent
Frame 2: The facility code and the next 2 bytes (middle) of the 6 byte Bluetooth ID is sent

A even MSB parity bit and a odd LSB parity makes a total of 26 bits (1+8+16+1) in each frame.

The Wiegand controller must be able to combine these frames.

In example:
Read Bluetooth ID: “0022B4B62508” => Bluetooth ID “B4B6” is send in frame 1 and Bluetooth ID “2508” is send in frame 2

9.3 Triple Wiegand 26

“03” = triple Wiegand 26 frame

Same as Wiegand 26 but the Bluetooth ID is sent in 3 Wiegand 26 frame with 25 ms delay between:
Frame 1: The facility code and the last 2 bytes (LSB) of the 6 byte Bluetooth ID is sent
Frame 2: The facility code and the next 2 bytes (middle) of the 6 byte Bluetooth ID is sent
Frame 3: The facility code and the first 2 bytes (MSB) of the 6 byte Bluetooth ID is sent

A even MSB parity bit and a odd LSB parity makes a total of 26 bits (1+8+16+1) in each frame.

The Wiegand controller must be able to combine these frames.

In example:
Read Bluetooth ID: “0022B4B62508” => Bluetooth ID “0022” is send in frame 1, Bluetooth ID “B4B6” is send in frame 2 and Bluetooth ID “2508” is send in frame 3. I.e. the full 6 byte ID is send

9.4 Wiegand 34

“04” = Wiegand 34

Uses the classic Wiegand 26 format but with an additional ID byte.

Frame: The facility code with the last 3 bytes (LSB) of the 6 byte Bluetooth ID is sent. A even MSB parity bit and a odd LSB parity makes a total of 34 bits (1+8+24+1)

In example:
Read Bluetooth ID: “0022B4B62508” => Bluetooth ID “B62508” is send

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9.5 Wiegand 42

"05" = Wiegand 42

Uses the classic Wiegand 26 format but with two additional ID byte.

Frame: The last 4 bytes (LSB) of the 6 byte Bluetooth ID is sent together with the facility code. A even MSB parity bit and a odd LSB parity makes a total of 42 bits (1+8+32+1)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "B4B62508" is send

9.6 Wiegand 50

"06" = Wiegand 50

Uses the classic Wiegand 26 format but with tree additional ID byte.

Frame: The last 5 bytes (LSB) of the 6 byte Bluetooth ID is sent together with the facility code. A even MSB parity bit and a odd LSB parity makes a total of 42 bits (1+8+40+1)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "22B4B62508" is send

9.7 Wiegand 58

"07" = Wiegand 58

Uses the classic Wiegand 26 format but with 4 additional ID byte. I.e. the full Bluetooth ID

Frame: All 6 bytes of the Bluetooth ID is sent together with the facility code. A even MSB parity bit and a odd LSB parity makes a total of 58 bits (1+8+48+1)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "0022B4B62508" is send

9.8 Wiegand 40 with XOR checksum

"08" = Wiegand 40 with XOR checksum

Uses a non standard Wiegand format with 3 ID bytes. Instead of the MSB and LSB parity bits a 8 bit XOR checksum is used.

Frame format:

8 bit Facility code	24 bit of Bluetooth ID	8 bit XOR checksum

Frame: The facility code with the last 3 bytes (LSB) of the 6 byte Bluetooth ID is sent together with an 8 bit XOR checksum. A total of 40 bits (8+24+8)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "B62508" is send

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9.9 Wiegand 56 with XOR checksum

"09" = Wiegand 56 with XOR checksum

Uses a non standard Wiegand 26 format with 5 ID bytes. Instead of the MSB and LSB parity bits a 8 bit XOR checksum is used.

Frame format:

8 bit Facility code	40 bit of Bluetooth ID	8 bit XOR checksum

Frame: The facility code with the last 5 bytes (LSB) of the 6 byte Bluetooth ID is sent together with an 8 bit XOR checksum. A total of 56 bits (8+40+8)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "22B4B62508" is send

9.10 Wiegand 64 with XOR checksum

"10" = Wiegand 64 with XOR checksum

Uses a non standard Wiegand 26 format with all 6 ID bytes. Instead of the MSB and LSB parity bits a 8 bit XOR checksum is used.

Frame format:

8 bit Facility code	48 bit of Bluetooth ID	8 bit XOR checksum

Frame: The facility code with all 6 bytes of the Bluetooth ID is sent together with an 8 bit XOR checksum. A total of 64 bits (8+48+8)

In example:
Read Bluetooth ID: "0022B4B62508" => Bluetooth ID "0022B4B62508" is send. I.e. the full 6 byte ID is send

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10 Virtual Keypad

The system has a wireless virtual keypad functionality which can operate in two different modes: “Virtual Keypad only Mode” and “Virtual Keypad Mixed Mode”

This feature will allow access to all users that know the 4 digit access PIN code or to any with a Bluetooth device.

10.1 Virtual Keypad only Mode

The system can be configured to run as a purely virtual keypad. I.e. no users have to be added. The system administrator adds a user with the special BD address “FFFFFFFFFFFF” (not a valid BD address) and a 4 digit access PIN code on **storage position 03** (Refer to section 8.2 Add new User Command).

The system will in this mode send the Bluetooth ID on the Wiegand bus for all users who enter the correct 4 digit access PIN code.

The request for PIN code is disabled when “0000” is entered as PIN code and thereby send all Bluetooth ID number on the Wiegand bus. I.e. a simple Bluetooth ID reader

The system administrator can at any time change the PIN code.

Caution!
If this special user is placed on storage position 01 or 02 all users will have the ability to add and delete users (privileged user) - if they know the correct access PIN code and the master PIN code. This is not recommended.

10.2 Virtual Keypad Mixed Mode

The system can be configured to be a mixed mode virtual keypad with up to 4/9/19 or 49 unique users and 2 privileged (number depends on purchased system version) and a virtual keypad user with the special BD address “FFFFFFFFFFFF” (not a valid BD address) and optional a 4 digit access PIN code.

The system will in this mode send the Bluetooth ID for all unique users after entering of their unique 4 digit access PIN code and the Bluetooth ID for all other users which enter the correct 4 digit virtual keypad access PIN code.

This feature allows the virtual keypad PIN code to be changed frequently without affecting the other users.

Caution!
The system will start to search for a match from position 01 going up. The virtual keypad user must be placed after the last used storage position or store it on the last storage position 7/12/22 or 52, if you want to be able to add more users in the future.

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11 User Access Key Setup

In principal all Bluetooth enabled devices can function as user access keys. If entering of PIN code is required the device must have a suitable keypad to enter the code.

The used Bluetooth device must also be configured to be visible from other Bluetooth devices to allow it to be detected by other Bluetooth devices. Please refer to MVC-Data "How to Get the Bluetooth ID" paper (http://www.mvc-data.com/Misc.html).

Note!
The time it takes to detect a nearby user can be influenced by:

- The time (Bluetooth inquiry scan time), i.e. the time a mobile phone uses to scan for other Bluetooth devices that want to connect to it. The time is typically set to a low value to preserve battery power. The time to discover a nearby Bluetooth enabled mobile phone strongly depends on implementation details for a particular mobile phone

- Radio noise from other radio communication in the 2400-2483,5 MHz (ISM) frequency band (e.g. WI-FI access points and other Bluetooth activity etc.) can course disturbances of the radio signals to/from the Bluetooth transceiver and consequently increase the detection time

- Metal surfaces in the vicinity can also course disturbances (distortion) or prevent radiation of the radio signals to and from the Bluetooth transceiver

- How the mobile phone/device is held in the hand may have an significant impact on the radio signals to and from the Bluetooth transceiver

11.1 Mobile Phone as Key

Any Bluetooth enabled mobile phone can be used as access key. No software has to be installed on the mobile phone.

The system will detect the mobile phone when it comes within the specified detection range.

TIP!
No pairing or search for devices must be active on the used mobile phone.

Steps:
1) Enable Bluetooth on mobile phone and set it to visible. Refer to the mobile phone's User Manual
2) Enter the 4 digit access PIN code when prompt (If PIN code is required)

Note!
The time (Bluetooth inquiry scan time) a mobile phone uses to scan for other Bluetooth devices, that want to connect to it, is typically set to a low value to preserve battery power. I.e. the time to discover a nearby Bluetooth enabled mobile phone strongly depends on implementation details for a particular mobile phone.

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11.2 GPS Key as Key

A Bluetooth GPS antenna is also suitable as a simple wireless key. It works fine with and without PIN code. The PIN is typically fixed to "0000" or "1234" so the PIN code can typically be left out.

The GPS antenna can typically not have an active connection to another Bluetooth device to be detectable/visible.

Note!
PIN "0000" means no PIN code in the GC400 system. Some battery powered devices will automatically switch off after e.g. 60 minutes to preserve battery power. Please refer to the GPS user manual for more details.

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12 Access Detection Range

The detection range may be influenced by the surroundings at the installation location (indoor or outdoor). If metal is close by reflections may increase/decrease the detection range.

It may also vary between the different used devices (mobile phones). I.e. some devices have a longer/shorter range than others because of different antenna designs and where and how they are placed (e.g. held in the hand or placed in the pocket etc.).

The system has some advanced and unique features to make individual adjustments of the detection range. Both the transmitted power (TX) and received signal power (RX) can be adjusted to compensate the installation environment and individual requirements. And the used devices can be added as a strong, standard or weak device to compensate for individual device characteristics.

If the detection range is not as expected the values can be adjusted up/down to find a suitable set of values. Please test and adjust as appropriate on location.

12.1 Detection Range Command Examples

The section shows some typical detection range commands you can use as a starting point to find your own specific values.

The first to value "**1,2**,30,0,0,1,1" corresponds to the used transmitting power (TX). The next parameter "1,2,**40**,0,0,1,1" corresponds to the received signal strength. Please refer to 8.5 Change System Configuration Command 2 – Advanced settings for more details.

Here are some example commands to start with:

Range	Distance	System Command
Very short range	≈ 10 cm	"1,2,30,**0,0,1,1**"
Door access - short	≈ < 50 cm	"1,4,50,**0,0,1,1**"
Door access - normal	≈ < 2 m	"2,3,60,**0,0,1,1**"
Gate access	≈ < 5 m	"2,6,70,**0,0,1,1**"
Gate access -long	≈ < 10 m	"2,8,80,**0,0,1,1**"
Very long range	≈ < 100 m	"3,8,99,**0,0,1,1**"

Note!
The values "1,2,40,**0,0,1,1**" in bold must match your requirements. The default values are used in these examples.

Please follow the descriptions in section 12.2 Detection range is to short and 12.3 Detection range is too long for adjusting to desired detection range up or down.

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12.2 Detection range is to short

Follow and repeat these steps to increment the detection range:

- Increase (+5) the <Detection range> value
- If <Detection range> =99 is not enough - increase (+1) <TX power level> and set <Detection range>=50
- Check detection distance – follow adjusting procedure depending on result

Final adjustment can be done by changing (±1) the <Detection range> value.

12.3 Detection range is too long

Follow and repeat these steps to shorten the detection range:

- Decrease (-5) the <Detection range>
- If(<Detection range>=0) then decrease (-1) the <TX power level> value and set <Detection range>=99
- Check detection distance – follow adjusting procedure depending on result

The final adjustment can be done by changing (±1) the <Detection range> value.

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13 Default Factory System Settings

Here is a short recap of the systems default settings:

- Virtual Keypad user 0xFFFFFFFFFF with PIN code "1234" is default on storage position 01
- Facility code is by default set to 32 (0x20)
- Wiegand type is standard Wiegand 26
- Detection range is approximately 20-40 cm
- Master PIN code is 12345678 – **Please change this as the first thing**

Below is a list of the commands for the default factory settings. These can be restored:

System Master PIN Code
12345678

Default System Settings 1 Normal Operation Mode
20,01

Note! Settings in **bold** is fixed for the duration of the system configuration mode.

Default System Settings 2 Normal Operation Mode
1,3,40,0,0,1,1

System Settings 2 System Configuration Mode
1,2,30,0,0,1,1

Default User
01,FFFFFFFFFFF,1234

13.1 Restore Factory Default System Settings

The Master PIN code and the other system configuration settings can be restored to factory settings:

Please follow the below steps:

Steps:

- Power off the device
- Disconnect input 2
- Disconnect output 1 and output 2 from the Wiegand bus
- Connect (short) input 2 with output 1 and output 2
- Power on the device – Wait - a short beep acknowledges that the factory settings have been restored
- Power off the device again
- Reconnect input 2
- Reconnect output 1 and output 2 to the Wiegand bus
- Device can safely be re-powered with the restored factory settings.

Caution!
General caution must be taken when working with the wires to avoid short circuits etc.

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14 Appendix A – User Log Template

Write your log of permitted users and store in a safe place

Storage Position	User Name	Bluetooth Address	PIN Code
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			

15 Appendix B – System Master PIN Code Log Template

Write your master PIN code here and store in a safe place

System Master PIN Code

16 Appendix C – System Configuration Log Template

Write your configuration setting here and store in a safe place

System Configuration 1

System Configuration 2

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17 Appendix B – Quick Guide:

Users must first be added to the system with an optional 4 digit user access PIN code before the Bluetooth ID will be sent on the Wiegand bus. All system commands (e.g. add user) can be send from a Bluetooth enabled mobile phone.

Please refer to section 7 How to Configure the System for more details about the different commands.

17.1 Mobile Phone used for Adding and Deleting Users – Normal Operation:

The privileged users (administrators) on storage position 01 and 02 can add and delete users in normal operation. Access PIN code required.

The user is first requested the normal 4 digit access PIN code. Then it will prompt for the 8 digit Master PIN code if the privileged user (administrator) has entered a valid add user or delete user command.

Steps:
1) Enable Bluetooth on the mobile phone and set it to hidden
2) Temporarily change the Bluetooth friendly name to the desired command:
Examples:

- **Add User** (Refer to section 8.2 Add new User Command):
  Add unique user 0022b4b62918 with PIN code 1234 enter on position 1:
  "**01,0022b4b62918,1234**"
  or
  Add unique user 0022b4b62918 without PIN code enter on position 1:
  "**01,0022b4b62918,0000**"
  or
  Add unique user 0022b4b62918 with PIN code 1234 and strong enter on position 1:
  "**01,0022b4b62918,1234,1**"
  or
  Add unique user 0022b4b62918 without PIN code and weak enter on position 1:
  "**01,0022b4b62918,0000,3**"

- **Delete User** (Refer to section 8.3 Delete User Command):
  Delete user stored on position 1 enter: "**01**"

3) Set the mobile phone to visible
4) Enter 4 digit access PIN code on mobile phone when prompt (ID is send if correct)
5) Wait for 3 short beeps which indicate that a valid command has been found and Master PIN code is required
6) Enter 8 digit Master PIN code on mobile phone when prompt – acknowledge with a short beep for successful execution
7) Set the mobile phone to invisible/hidden

8) Erase the command in the mobile phone

For more commands – repeat step 1) – 7)

If no more commands are required - Set friendly name back to desired name.

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17.2 Mobile Phone used for System Commands - System Configuration Mode:

All mobile phones can in system configuration mode be used to enter system commands like adding and deleting users. Refer to section 7.2 How to enter Configuration Mode for more details about the systems commands:

The system will prompt for the 8 digit Master PIN code if a valid system command is found.

Steps:

1) Set system into configuration mode by pulling the buzzer input (IN2) to GND. Refer to section 7.2 How to enter Configuration Mode for more details
2) Enable Bluetooth on the mobile phone and set it to hidden
3) Temporarily change the Bluetooth friendly name to the desired command:
Examples:

- **Change Master PIN** (Refer to section 7.2 How to enter Configuration Mode):
  Change Master PIN to 12345678 enter: "**12345678**"

- **Add User** (Refer to section 8.2 Add new User Command):
  Add unique user 0022b4b62918 with PIN code 1234 enter on position 1:
  "**01,0022b4b62918,1234**"
  or
  Add unique user 0022b4b62918 without PIN code enter on position 1:
  "**01,0022b4b62918,0000**"

- **Delete User** (Refer to section 8.3 Delete User Command):
  Delete user stored on position 1 enter: "**01**"

- **Change Wiegand type**(Refer to section 8.4 Change System Configuration Command 1)
  Facility code is 32 (0x20) and Wiegand type is changed to standard Wiegand 26 enter:
  "**20,01**"

- **Change Detection Range** (Refer to section 8.5 Change System Configuration Command 2 – Advanced settings):
  Select power range 2 (<10 m), and approximately 5 m with input 1 and 2 active at low level (GND) and output 1 and 2 with high level enter: "**2,6,50,0,0,1,1**"

4) Set the mobile phone to visible
5) Place mobile phone within the detection range of the system
6) Wait for 3 short beeps which indicate that a valid command has been found and Master PIN code is required
7) Enter 8 digit Master PIN code on mobile phone when prompt
8) Wait for beep for successful execution
9) Set the mobile phone to invisible/hidden

10) Erase the command in the mobile phone

For more commands – repeat step 2) – 9)

If no more commands are required - Set friendly name back to desired name.

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17.3 Mobile Phone as Access Key:

Any Bluetooth enabled mobile phone can be used as access key. No software has to be installed on the mobile phone.

The system will detect the mobile phone when it comes within the specified detection range.

TIP!
No pairing or search for devices must be active on the used mobile phone.

Steps:
1) Enable Bluetooth on mobile phone and set it to visible. Refer to the mobile phone's User Manual
2) Enter the 4 digit access PIN code when prompt (Only if PIN code is required)

Note!
The time (Bluetooth inquiry scan time) a mobile phone uses to scan for other Bluetooth devices, that want to connect to it, is typically set to a low value to preserve battery power. I.e. the time to discover a nearby Bluetooth enabled mobile phone strongly depends on implementation details for a particular mobile phone.

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